Autonomously Attaching Camera Trap

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Design Objective

To create a device that autonomously attaches to tree branches in the rainforest. The device will be carried by a drone and should record any wildlife that moves across a selected branch with an integrated camera. Our client will use this device in the Rainforest XPRIZE Competition.

Background and Motivation

Motivation

- Humans scale trees to manually implement cameras, which is dangerous and takes too much time

XPRIZE Competition

- Teams create novel technology to record and assess the biodiversity in rainforests
- Goal is to better understand and monitor rainforest ecosystems
- Competition only allows contestants to record biodiversity data for 8 hours - solution should cut down the time to setup camera traps

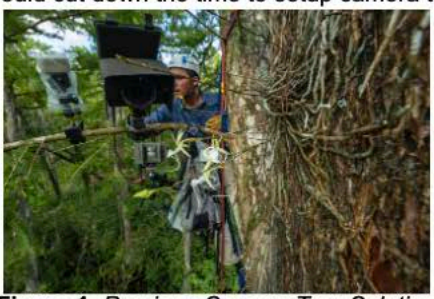

Figure 1. *Previous Camera Trap Solution*

Design Criteria

Criteria	Target Value
Duration	≥ 8 hours on branch
Weight	< 1 lb.
Cost	Total cost < $100
Durability	Lasts for ≥ 8 hours of rainfall
Size	Fits within < 1 ft^3
Camera Range	≥ 30 ft

Results

Final Solution

- Outer Casing:
  - 3D-printed PLA box with a slidable panel
  - Sides of casing have knobs to connect to finger-jointed clamps
- Clamps:
  - Finger joints that bend at intervals
  - Rubber strips superglued on the inside of clamps to provide extra grip
  - Fishing wire runs through the clamps to pull the clamps and curl them around branch

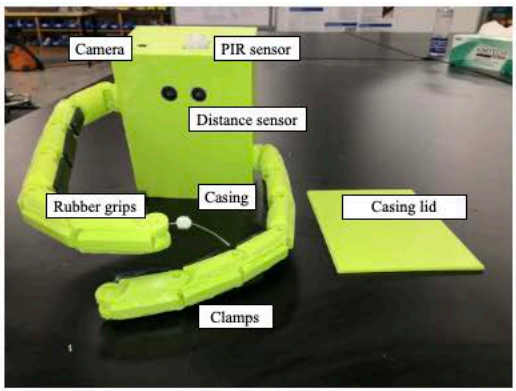

Figure 2. *Mechanical Components*

- Camera:
  - Camera module for Raspberry Pi
- Electronics:
  - Distance sensor on bottom of casing senses arrival at the branch
  - Stepper motor pulls fishing wire around a spool to tighten clamps

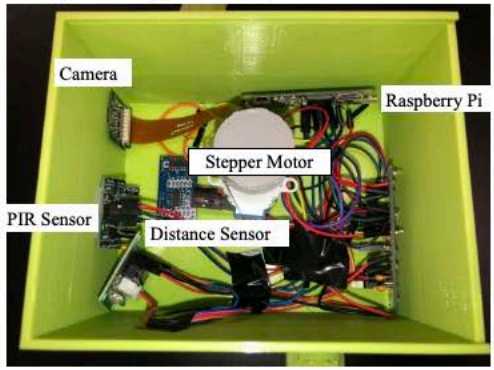

Figure 3. *Electrical Components*

Testing

Design Criteria	Test	Results
Duration	Leave attached to branch for 8 hours	TBD
Weight	Weigh final solution	1.07 lbs > 1 lb FAIL
Cost	Calculate cost of the solution	$64.82 < $100 PASS
Durability	Soak with 204 mL of water	Only a few droplets inside PASS
Size	Measure total volume of solution	0.302 ft^3 < 1 ft^3 PASS
Camera Range	Take pictures at 5 ft intervals up to 30 ft	Image readable at 30 ft PASS

Conclusion

Summary:

- We created a device that autonomously senses when it's set on a branch, contracts its clamps to stay on top of the branch for long periods of time, and takes pictures when it detects animals moving nearby

Future Work:

- Develop integrated method to attach and detach solution to drones
- Refine components to reduce likelihood of failure or damage

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